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ABSTRACT

The purpose of this study was to develop an appropriate methodology and use it to estimate the costs of providing appropriate special education programs and services for all school-aged handicapped children in the U.S. in 1980-81. A resource-cost model approach was selected, based on a mathematical formulation of the relationships among students, programs, resources, and decision rules involved in the special education process. Data from 26 states concerning current and expected programming practices and characteristics of the handicapped population formed the data base to operate the resource-cost model. Results showed the most likely estimate of special education costs for all school-aged handicapped children in 1980-81 to be $7.926 billion. Extremes of the high ($20 billion) and low ($4 billion) estimates indicated the critical importance of program decisions. The paper concludes with a discussion of policy implications and uses of both the resource-cost methodology and the cost estimates, together with future research questions suggested by the study. (Author/LD)

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ESTIMATING THE COSTS OF EDUCATING HANDICAPPED CHILDREN: A RESOURCE-COST MODEL APPROACH - SUMMARY REPORT

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June 1979

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This paper provides a comprehensive summary of a larger study of the same title. The full report is available from either the funding agency or University Microfilms International, Ann Arbor, MI. The research for the study was supported by grant no. G00780013, Bureau of Education for the Handicapped, U.S. Office of Education, DHEW. The results, analyses, and conclusions do not necessarily represent the positions or policies of the U.S. Office of Education or the Institute for Research on Educational Finance and Governance.

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ESTIMATING THE COSTS OF EDUCATING HANDICAPPED CHILDREN:

A RESOURCE-COST MODEL APPROACH

SUMMARY REPORT

Abstract

In the last decade, state and federal legislative and judicial mandates have firmly established the educational rights of all handicapped children. As a result, there have been major financial commitments made on future federal, state, and local resources, but it is not known what the magnitude of these commitments might be. The purpose of this study was to develop an appropriate methodology and utilize it to estimate the costs of providing appropriate special education programs and services for all school aged handicapped children in the United States in 1980-81.

A resource-cost model approach was selected as the most suitable cost estimation methodology. This approach is based on a mathematical formulation of the relationships among students, programs, resources, and decision rules involved in the special education process. Data from 26 states concerning current and expected programming practices and characteristics of the handicapped population formed the data base to operate the resource-cost model. Three values were established for each model variable--"most likely," low alternative, and high alternative--and separate cost projections were developed for each set of values. Estimates were also developed for the costs of certain related services for handicapped students.

The most likely estimate of special education costs for all school aged handicapped children in 1980-81 was $7.926 billion, while the low alternative estimate was $3.893 billion and the high alternative estimate was $20.488 billion. These extremes indicated the critical importance of the programmatic decisions and assumptions which underlay the cost estimates.

To test the impact on the total cost estimates of each variable in the resource-cost model, a series of sensitivity analyses were conducted. The most sensitive variables were the incidence rate for the handicapping conditions and the number of students per unit of an instructional program.

Finally, the policy implications and uses of both the resource-cost methodology and the cost estimates are discussed, together with future research questions suggested by the study.

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Introduction

Recent political and legal mandates have firmly established the educational rights of all handicapped children. In the last decade, new laws enacted in 48 states and a series of favorable court rulings have been instrumental in creating a broad legal base for the education of handicapped children.[1] At the federal level, P. L. 94-142, the "Education for All Handicapped Children Act of 1975," has set as a national policy that all handicapped children are to receive a free, appropriate public education by 1980. Special education, as education for the handicapped is known, faces an enormous challenge to which it must respond. Even with a history of more than one hundred years of special education in the United States, estimates from professionals in the field indicate that from one-quarter to one-half of the handicapped children in this country either receive no educational services or are in an inappropriate education program.[2] Using the lower of these estimates, this would mean that there are in excess of one million handicapped children still in need of appropriate educational services.

What will it cost to meet the mandates of P. L. 94-142 and similar state legislation and to provide all handicapped children with an education appropriate to their needs? The answer is that "it depends." Specifically, it depends upon a variety of interrelated programmatic decisions, policies, procedures, and changes which are presently underway and will be continuing in the future. How to estimate the expected costs of special education under these conditions was the central focus of this study. Specifically, the purpose of the study was to estimate the costs of providing all school aged handicapped children in the United States with an appropriate education in 1980-81.

Estimation of costs in special education is a complex undertaking. The determinants of costs are imbedded in the programmatic aspects of the educational process. In essence, the question of what are the costs of special education is the last one that can be answered. To arrive at that point, a whole series of programmatic questions must be resolved first. These include: Which children are handicapped to the extent that they require special education? How many such children are there? What educational programs and services are needed for handicapped children? How do the appropriate programs and services differ by type of handicap and for children with differing degrees of severity of the same handicap? What do the programs and services consist of? What resources (e.g., personnel, instructional materials and supplies, equipment, facilities) are required in each type of program and service? What are the quantities and prices of the necessary resources? How many children can be served by one unit of each program or service?

Future cost estimates of special education must take into account the expected changes in programs and practices caused by recent legislative and judicial actions, implementation efforts of school districts, and advances in curriculum and educational technology. An extrapolation of the past is an inadequate means of predicting the future for special education. Through new laws and regulations, the federal and state levels have undertaken a deliberate effort to cause programmatic changes at the local level. Among the many programmatic changes which are occurring or are expected to occur are: handicapped children being served in the least restrictive environment, including a substantial use of regular education programs; great increases occurring in the number of mildly handicapped students in special education; educational services being provided to severely handicapped

children who were previously excluded; new types of instructional programs being more widely available; additional special education services going beyond instruction--identification, assessment and instructional planning, highly specialized materials and equipment, and specialized therapy; a greater individualizing of instruction based on the specific educational needs of each handicapped student; and new procedures such as an individual educational program for each handicapped student, due process requirements, and increased local planning being required of school districts.

Once the programmatic issues are resolved, the calculation of costs can proceed in a relatively straightforward manner. However, there are significant problems in attempting to answer the fundamental programmatic questions in special education. These difficulties are caused by: the lack of clear, educationally relevant definitions of handicapping conditions; no reliable information about the rate of occurrence of handicapping conditions; a lack of knowledge of the educational effects of various types of special education programs; professional disagreements over how various handicapped children can be best treated educationally, the shortage of specific data concerning the effectiveness of alternative patterns of resource use in special education programs; wide variation in actual practice in the programs and services provided to similarly handicapped children in different states and school districts; a general lack of standardization of definitions, policies, programs, practices, and procedures across states and school districts; and underlying it all, a lack of clarity over the various objectives of different special education programs (e.g., academic achievement, social behavior, vocational competence, self-help skills).

With these difficulties in mind, three main objectives were established for a suitable cost estimation methodology. First, it was necessary that the programmatic aspects of special education--student and program characteristics and their relationships, as well as the educational decisions and policies involved in special education--formed the basis of the cost estimation procedures. Next, the widespread variation in actual program practices and the unavailability of accepted standards to guide national projections had to be dealt with adequately. Finally, future program practices in special education had to be incorporated into the approach and the cost impact of the uncertainty surrounding their occurrence made explicit.

A review of past efforts at special education cost estimation revealed first, that there have been few efforts to project the costs of educating handicapped children on a comprehensive, national basis, and, second, that all such studies had serious limitations.[3] Several shortcomings predominated in these studies: past program practices formed the basis for future cost estimates; the methodologies did not allow for the inclusion of future programmatic expectations and assumptions which were significantly different from the past situation; the methodologies obscured the programmatic relationships which made it impossible to correct for future changes; the uncertainty associated with future changes in special education and its impact on costs was not recognized; use of aggregated per student cost figures may have hidden large cost variations; average, rather than marginal, costs were used to project the costs of serving additional students; manipulation of cost records and arbitrary cost allocations may have distorted critical input data used in the projections; and the studies were, for the most part, localized and the results were not able to be generalized due to the unique nature of the jurisdiction studied.

The Resource-Cost Model Approach

To meet the cost estimation methodology objectives and to overcome the difficulties of previous studies, a resource-cost model approach was used. This approach is based on a mathematical formulation of the relationships among students, programs, resources, and decision rules involved in the special education process. The students to be served and the instructional programs which were to be utilized were specified along with the resources used in each program (e.g., teacher, aide, instrucitonal materials and supplies, and maintenance and operating expenses). Prices were assigned to each resource, and costs were then estimated based on the values of the programmatic and price variables specified in the model.

A particular resource-cost model of the special education process, the Special Education Planning Model (SEPM), was used to develop the cost estimates in this study.[4] Figure 1 provides a schematic representation of the model. Two types of data were required for operation of the model: decision variables and planning variables. The values for the decision variables represented programmatic choices, judgments, and assumptions about the special education process made by educational decision makers or planners. These variables ranged from broad policy decisions to specific operating rules (e.g., handicapping conditions to be served by special education, estimated incidence rates of handicapping conditions, programs and services to be provided, use of resources within each program and service, allocation of handicapped students to programs, number of students per unit of each instructional program). The planning variables, although out of the control or influence of the decision makers, affected both the special education programs and their costs, and values for these variables were also

Figure 1

The Special Education Planning Model

Total School Age Population*	x	Incidence Rate (%) of Children in Total Population Needing Special Education by Type of Handicap (or Other Classification System)	=	Number of Students to Receive Special Education by Type of Handicap

For Each Program:

Types of Special Education Programs to be Provided	:	Resources Comprising the Program	x	Quantity of Each Resource	x	Price of Each Resource**	=	Unit Cost of Each Program

Number of Students to Receive Special Education by Type of Handicap	x	Percentage of Students by Handicap to be Placed in Each Program***	=	Number of Students by Handicap to be Placed in Each Program

Number of Students By Handicap to be Placed in Each Program	÷	Number of Students Per Unit for Each Program and Handicap	=	Number of Personnel Required for Each Program and Handicap

Number of Units (Personnel) Required for Each Program and Handicap	x	Unit Cost of Each Program	=	Total Cost of Special Education for Each Program and Handicap

$\sum$ Total Cost of Special Education for Each Program and Handicap	=	Total Cost of Special Education

* These projections are done annually for up to ten years.

** An inflation factor is included to adjust for future price level changes.

*** These allocations may change over time to show the impact of programmatic shifts.

established. Examples of planning variables in SEPM were the total school age enrollment and the inflation rate. For both types of variables, data concerning the present situation and the expected future conditions were required by the model.

In comparison with previous cost estimation studies, the resource-cost model approach offered a number of important advantages for estimating the costs of special education.

1. The approach concentrated on the educational and programmatic relationships and decisions which were involved in special education. It then translated these programmatic aspects into costs.
2. The approach explicitly identified and specified the educational programs for which costs were to be estimated. The educational process was not hidden in the calculations.
3. The aspects of the educational process which were relevant to special education were included (i.e., instructional programs) and those not relevant were excluded (i.e., district administration).
4. The approach proved highly flexible. Many different educational situations, student classification systems, types of programs, and types of costs were accommodated in the resource-cost model. For example, while traditional handicapping conditions were most frequently chosen as the classification system, other bases such as grouping students by learning needs were also employed.
5. The focus of the cost estimation and associated analytical efforts were controlled by the objective of the study, not by the availability of cost accounting data.
6. The approach was oriented toward the future. Cost estimates were based on expectations about future programs rather than historical practices and costs.
7. The use of a model permitted a sensitivity analysis of each of the model's variables--an analytical testing of the cost impact of

varying the assumptions concerning the key elements of the special education process and their relationships. In this fashion, it was possible to estimate the cost changes caused by a wide range of future conditions and possible program practices. While not resolving the uncertainty inherent in the future of special education, this procedure was able to develop a range of possible cost levels under various circumstances.

One additional aspect of the resource-cost model approach, critical to policy analysis, should be noted. Through the use of this model, it is possible to evaluate the cost impact of tradeoffs among alternative educational proposals. By providing information about the expected costs of each proposal, the resource-cost model methodology can assist decision makers in setting priorities among various competing proposals and in allocating limited funds among them. For example, cost projections from the resource-cost model approach may indicate that sufficient funds are not available to fund two different proposals--lowering the class size by an average of three students in special classes or providing speech and language instruction to students in those classes. However, the methodology can be used to explore in further analyses how programmatic compromises might be made to achieve a portion of the objectives of each proposal and still remain within budget limitations. This could mean lowering the class size by one instead of three and providing speech and language instruction to only half of the students. Additionally, if several proposals are aimed at achieving the same objective(s), a comparison of the relative costs of each proposal can aid in selecting the most cost-efficient alternative.

There were, however, several limitations or problems with the resource-cost model approach which were encountered during the course of the study. Some of the data required by the model were not routinely collected or available

in school systems. This was particularly true with data presented by type of instructional program (i.e., specific resources in each program, allocation of handicapped students to each program, and actual number of students per each instructional unit). In these cases, it was necessary to calculate or estimate the required values from data that were available. There was a related lack of data on which to make estimates of future special education conditions; in estimating the future, there was an inevitable reliance on professional judgments of special educators. The resultant estimates depended, in large part, on their abilities--from a simple extrapolation of the current situation to a thorough analysis of future programmatic trends. The focus on the future and the lack of firm data about future conditions also subjected the approach to bias or manipulation through the estimation of the expected situation. This was an inherent shortcoming, but one that was countered by making the assumptions about the future explicit and open to challenge.

National Cost Estimates

Data from 26 states which had used the SEPM resource-cost model to develop their own state special education cost estimates were used to generate estimates of the total costs of providing an appropriate education to all school aged handicapped children in the United States from 1976-77 to 1980-81. This sample of states presented a wide spectrum of population, geographic, and demographic characteristics, as well as special education approaches and programming practices. From the input data prepared by each state, information required by the model concerning both the current programming practices and the characteristics of the handicapped population served by each state were obtained along with their expectations for the future for their special education programs. The eight instructional programs

derived from the states' data represented a variety of alternatives ranging from indirect and direct services in the regular classroom to resource rooms to special classes to residential schools.

Three values were established for each model variable--"most likely," low alternative, and high alternative. The most likely values were based on averages of the states' data. Low alternative values reflected conditions such as less costly programs, conservative estimates of incidence rates and student/teacher ratios, while for high alternative values the reverse was true.

Using the most likely values of the model variables, national projections which represented the most likely estimates of future special education costs were developed with the SEPM resource-cost model. The results from these projections indicated that the most likely estimate of special education instructional costs in 1980-81 was $6.533 billion (including the effects of inflation at 6.77% annually from 1976-77). The most likely estimates shown both by handicapping category and by instructional program are provided in Tables 1 and 2. These estimates included the costs of instructional programs for all school aged handicapped children. Excluded from this estimate were the regular education costs incurred by handicapped students receiving portions of their education in regular classrooms and costs for pre and postschool aged handicapped students. Further, the estimate was not an excess cost because the equivalent costs of regular education were not deducted from the cost estimates of special education programs involving separate instruction. Nevertheless, this estimate represented the total special education program cost, which was considered by this study to reflect the most meaningful and useful type of cost projection.

TABLE 1

MOST LIKELY PROJECTIONS OF STUDENTS, TEACHERS, AND COSTS BY CLASSIFICATION
(costs in thousands of dollars)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
STUDENTS	759865	762641	774777	797499	833102
CERTIFIED PERSONNEL	46927	46919	47304	48130	49500
COSTS (CONSTANT)	966433	960002	955094	951879	950952
TMR					
STUDENTS	201990	198017	192073	184766	176860
CERTIFIED PERSONNEL	15775	15539	15215	14842	14470
COSTS (CONSTANT)	613945	597065	569813	534664	494608
HEARING					
STUDENTS	91178	93733	99517	108541	121009
CERTIFIED PERSONNEL	6438	6610	6998	7602	8429
COSTS (CONSTANT)	326245	325219	323690	317722	301716
SPEECH					
STUDENTS	1341152	1368694	1434205	1538471	1684820
CERTIFIED PERSONNEL	22508	22859	23723	25079	26923
COSTS (CONSTANT)	361235	367955	384144	409820	445461
VISION					
STUDENTS	40085	39522	38782	37971	37234
CERTIFIED PERSONNEL	2373	2347	2316	2286	2269
COSTS (CONSTANT)	101893	99125	94616	88729	81943
SED					
STUDENTS	293856	306616	334066	375970	432841
CERTIFIED PERSONNEL	23675	24513	26293	28891	32185
COSTS (CONSTANT)	663692	684287	727606	788578	861351
ORTHO					
STUDENTS	88441	89338	91866	96134	102392
CERTIFIED PERSONNEL	6319	6387	6572	6886	7345
COSTS (CONSTANT)	163328	163873	166162	170210	176078
OHI					
STUDENTS	133898	137070	144432	156038	172205
CERTIFIED PERSONNEL	11062	11299	11851	12715	13902
COSTS (CONSTANT)	323597	328248	339502	356456	378188
SLD					
STUDENTS	816525	836540	882747	955427	1056503
CERTIFIED PERSONNEL	40947	41869	44014	47364	51973
COSTS (CONSTANT)	770310	785744	821952	877920	953587
MULTIPLE					
STUDENTS	70392	71838	75276	80748	88430
CERTIFIED PERSONNEL	6735	6958	7469	8301	9511
COSTS (CONSTANT)	343882	346945	355169	367546	382868
TOTAL					
STUDENTS	3837382	3904009	4067741	4331565	4705396
CERTIFIED PERSONNEL	182759	185300	191755	202096	216507
COSTS (CONSTANT)	4634560	4658463	4737748	4863524	5026752
COSTS (INFLATED)	4634560	4973838	5400943	5919669	6532549

TABLE 2

MOST LIKELY PROJECTIONS OF STUDENTS, TEACHERS, AND COSTS BY INSTRUCTIONAL PROGRAM
(costs in thousands of dollars)

TYPE OF PROGRAM	YEAR				
	76-77	77-78	78-79	79-80	80-81
INDIRECT SERVICES					
STUDENTS	142072	147132	158627	177242	204311
CERTIFIED PERSONNEL	1809	1876	2027	2270	2624
COSTS (CONSTANT)	27880	28912	31240	34985	40441
SPEECH & LANGUAGE INSTR					
STUDENTS	1468391	1505738	1592623	1731649	1929388
CERTIFIED PERSONNEL	21963	22522	23825	25913	28878
COSTS (CONSTANT)	344972	353752	374219	407015	453586
OTHER DIRECT SERVICES					
STUDENTS	176498	185753	206636	241396	293875
CERTIFIED PERSONNEL	7027	7389	8208	9576	11645
COSTS (CONSTANT)	110949	116664	129596	151195	183862
RESOURCE ROOM					
STUDENTS	918830	955083	1037230	1171280	1368358
CERTIFIED PERSONNEL	39968	41586	45249	51235	60053
COSTS (CONSTANT)	694843	722972	786653	890720	1044021
SPECIAL CLASS					
STUDENTS	1241579	1236823	1234546	1229650	1215148
CERTIFIED PERSONNEL	107882	107680	107890	108045	107522
COSTS (CONSTANT)	1996464	1992726	1996612	1999480	1989801
OTHER AGENCY DAY SCHOOL					
STUDENTS	21714	21543	21334	21000	20424
CERTIFIED PERSONNEL	0	0	0	0	0
COSTS (CONSTANT)	80059	79429	78658	77426	75303
RESIDENTIAL SCHOOL					
STUDENTS	126692	125009	122316	117912	110776
CERTIFIED PERSONNEL	0	0	0	0	0
COSTS (CONSTANT)	1316329	1298843	1270863	1225105	1150962
HOSPITAL & HOMEBOUND					
STUDENTS	31588	32690	35187	39214	45033
CERTIFIED PERSONNEL	4110	4247	4556	5057	5785
COSTS (CONSTANT)	63096	65199	69943	77635	88811
TOTAL					
STUDENTS	4127364	4209771	4408499	4729343	5187313
CERTIFIED PERSONNEL	182759	185300	191755	202096	216507
COSTS (CONSTANT)	4634592	4658497	4737784	4863561	5026787
COSTS (INFLATED)	4634592	4973874	5400985	5919714	6532594

In addition to the most likely estimate, alternative low and high projections, based on the low and high alternative values of the model variables, were developed to indicate the range of possible costs under consistently low or high assumptions about the future. These alternative projections also provided an indication of the uncertainty associated with the projected future costs of special education. The results yielded an extremely wide range of possible instructional costs in 1980-81, from a lower limit of $2.682 billion (inflated) to an upper limit of $18,856 billion (inflated). These extremes indicated the importance and critical nature of the programmatic decisions and assumptions which underlay the cost estimates.

Estimates were also developed for the costs of certain related services for special education students (e.g., special transportation, physical and occupational therapy, identification and assessment activities, local administration, and inservice training for teachers). These estimates were developed using a very narrow data base from the limited number of states in the sample which projected related services. As a result, the estimates were much less reliable than those for instructional programs. However, they were calculated in order to apply the resource-cost model methodology to this cost category and to provide a very general estimate of the possible costs. The most likely costs for related services in 1980-81 was $1.393 billion, with the low alternative estimate of $1.211 billion and the high alternative estimate of $1.632 billion (all in inflated dollars). The most likely related services projections are shown in Table 3.

The results are summarized in Table 4 for the three different cost estimates. Since the related services estimates were incomplete, the most

TABLE 3

MOST LIKELY PROJECTIONS OF RELATED SERVICES
(costs in thousands of dollars)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
EMR					
VOC SERV					
STUDENTS	53190	68637	100720	151524	224937
PERSONNEL	0	0	0	0	0
COSTS	21914	28278	41496	62427	92674
TMR					
SP TRANS					
STUDENTS	92915	92869	93539	94969	97273
PERSONNEL	0	0	0	0	0
COSTS	72194	72159	72679	73790	75581
HEARING					
SP TRANS					
STUDENTS	28265	29619	32641	37555	44773
PERSONNEL	0	0	0	0	0
COSTS	16845	17652	19454	22382	26684
VISION					
SP TRANS					
STUDENTS	12025	12607	13845	15719	18244
PERSONNEL	0	0	0	0	0
COSTS	6866	7198	7905	8975	10417
SED					
PSY SERV					
STUDENTS	35262	49978	83182	142116	238062
PERSONNEL	0	0	0	0	0
COSTS	13223	18741	31193	53293	89273
ORTHO					
P T					
STUDENTS	13266	15098	19016	25379	34813
PERSONNEL	0	0	0	0	0
COSTS	6261	7126	8975	11978	16431
O T					
STUDENTS	2653	3841	6338	10382	16382
PERSONNEL	0	0	0	0	0
COSTS	1191	1724	2845	4661	7355

TABLE 3

MOST LIKELY PROJECTIONS OF RELATED SERVICES
(costs in thousands of dollars)
(continued)

CLASSIFICATION	YEAR				
	76-77	77-78	78-79	79-80	80-81
SP TRANS					
STUDENTS	24763	28230	35643	47682	65530
PERSONNEL	0	0	0	0	0
COSTS	19042	21708	27409	36667	50392
MULTIPLE					
SP TRANS					
STUDENTS	34492	37786	45015	57008	75165
PERSONNEL	0	0	0	0	0
COSTS	17970	19686	23452	29701	39160
ASSESS					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	178420	204334	256163	333906	437564
LEA ADMN					
STUDENTS	0	0	0	0	0
PERSONNEL	2900	3320	4160	5420	7100
COSTS	65684	75197	94223	122762	160814
INSERV					
STUDENTS	0	0	0	0	0
PERSONNEL	0	0	0	0	0
COSTS	27118	30951	38617	50116	65448
TOTAL COST					
CONSTANT $	446728	504754	624411	810658	1071793
INFLATED $	446728	538925	711816	986697	1392855

TABLE 4

ESTIMATES OF NATIONAL SPECIAL EDUCATION COSTS IN 1980-81
FOR SCHOOL AGED HANDICAPPED STUDENTS
(dollars in billions and inflated at 6.77% from 1976-77)

Type of Cost	Most Likely Estimate	Low Alternative	High Alternative
Instructional Programs	$6.533	$2.682	$18.856
Related Services	$1.393	$1.211	$ 1.632
Total	$7.926	$3.893	$20.488

likely estimate of the costs of special education for school aged handicapped children in 1980-81 should reach at least $8.0 billion (inflated dollars). As a point of reference, the comparable reported federal, state, and local costs for special education in 1976-77 were $4.485 billion.[5]

Sensitivity Analysis

To test the impact on the total cost estimates of each variable in the model, a series of sensitivity analyses were conducted. With the most likely estimates as the base case, the low and then high values for one variable at a time were substituted and new projections developed. The impact on costs of each variable was measured in two ways--the dollar amount of the resultant change and a sensitivity index (the ratio of the percentage change in costs to the percentage change in the value of the model variable). The most important variables in terms of these two measures were the incidence rates assumed for handicapping conditions and the number of students per unit of an instructional program. Other variables of importance were the expected program placements of handicapped students, use of instructional aides, the average cost per student in residential programs, use of personnel and non-personnel resources, prices for these resources, and the inflation rate. Table 5 shows the cost changes caused by substituting the low and high alternative values for each variable along with the sensitivity index for the variable. For instance, the most likely total incidence rate was assumed to be 10.11% of the total school age population. Replacing this value with the low alternative value of 7.80% resulted in a reduction of $1,142,520,000 in the estimated costs and using the high alternative value of 12.97% caused an increase in the estimated costs of $1,422,779,000. The sensitivity index of 1.00 indicated that a one percent change in the incidence rate would cause a one percent change in the estimated costs.

TABLE 5

SUMMARY RESULTS OF SENSITIVITY ANALYSES

Model Variable	Most Likely Value	Alternative		Cost Change (Reduction)	Sensitivity Index
		Type	Value		
Total Student Population	46,542,000 students	Low	46,281,000	($ 28,184,000)	1.00
		High	46,871,000	$ 55,574,000	
Total Incidence Rate	10.11%	Low	7.80%	($1,142,520,000)	1.00
		High	12.97%	$1,422,779,000	
Teacher Salary	$12,628/ teacher	Low	$11,365	($ 350,024,000)	0.70
		High	$13,890	$ 349,875,000	
Non-personnel Resources (materials, maintenance, travel)	$ 1,381/ unit	Low	$ 687/ unit	($ 176,948,000)	0.07
		High	$ 2,392/ unit	$ 245,680,000	
Average Cost per Student in Residential Programs	$10,390/ student	Low	$ 8,000	($ 264,754,000)	0.24
		High	$14,000	$ 399,901,000	
Inflation Factor	6.77%	Low	5.51%	($ 302,945,000)	0.25
		High	8.23%	$ 364,709,000	
Placement Pattern	Future Most Likely Pattern	Low	More Mainstreaming	($ 481,234,000)	NA
		High	Current Pattern	$ 563,325,000	

TABLE 5

SUMMARY RESULTS OF SENSITIVITY ANALYSES
(continued)

Model Variable	Most Likely Value	Alternative		Cost Change (Reduction)	Sensitivity Index
		Type	Value		
Number of Students Per Unit (overall average)	24 students/ unit	Low	31	($ 844,010,000)	0.75
		High	17	$1,575,679,000	
Use of Instructional Aides (Resource Room and Special Class only)	RR: .30 aide/tchr SC: .44 aide/tchr	Low	RR: 0 aide/ teacher SC: .25 aide/teacher	($ 213,484,000)	0.07
		High	RR: 1.0 aide/ teacher SC: 1.0 aide/ teacher	$ 568,215,000	

Policy Implications

Both the resource-cost model approach and the results achieved in this study have raised a number of interesting policy issues for consideration. The major ones are listed below.

1. The most likely cost estimates indicate that a significant increase in funding is necessary to serve all school aged handicapped children in an educationally appropriate manner and to meet the federal and state legislative and judicial mandates--approximately $2.5 billion by 1980-81. Where will the additional funds come from--federal, state, or local sources? What would the proportions of special education funding by the different government levels be? What shifts in program and fiscal control would be likely to occur with changes in funding patterns?

2. The level of future costs in special education can be influenced by programming decisions. It is possible to gain more control over the future uncertainty through policy decisions. The degree of control will probably be greatest at the local level where the operating decisions are made; however, program standards and regulations promulgated at the state and federal levels a means of controlling or influencing special education costs.

3. Tradeoffs among different program practices offer possibilities to balance cost changes against perceived changes in program quality. Changes which increase costs can be counter balanced by other changes which would reduce costs. For example, a greater use of instructional aides (cost increase) in certain programs could be combined with a higher number of students per unit (cost reduction) in those programs. Another type of tradeoff deals with establishing priorities among competing program proposals

to meet budgetary limitations. By focusing on the programmatic aspects and using the resource-cost model to translate program considerations into costs, this approach provides essential information for decision makers for choosing among different proposals and for making compromises among them.

4. The pressure on educational budgets from enrollment declines and taxpayer revolts combined with an increase in federal funds for special education could lead to a broader definition of special education in order to include more mildly handicapped students and, perhaps, even some students previously served in regular education programs, such as remedial studies. The availability of funds could also result in a takeover by special education of certain regular education services, such as social work, guidance and counseling, health, psychological testing, and educational media. The potential magnitude of future special education funds, particularly from P. L. 94-142, represents a possible opportunity for significant cost shifts from regular education to special education within the overall education budget. Depending on the extent of such funding shifts and the uses for which the funds are expended, the objectives of special education could be either enhanced or diluted.

5. The influx to school districts of large amounts of federal funds for special education may be at odds with other efforts at school finance reform. The federal funds from P. L. 94-142 will not serve to reduce the existing educational finance disparities between rich and poor school districts. However, that is not their purpose; the attainment of equal educational opportunity for handicapped students means more services, resources, and costs. These categorical funds have a different purpose than regular education funds and cannot be measured by the same equity yardstick.

6. When utilizing the resource-cost model approach at a district or region level, the effects of uneven geographic distribution of handicapped children necessitate special treatment in at least two areas--low population density rural programs and inner city population concentrations. In both cases, the resource-cost model approach can be used to encourage and examine flexibility in programming to provide adequate educational services to handicapped students in an efficient manner.

Future Research Directions

In the course of this study, a number of topics were encountered which are in need of further investigation. They range from theoretical considerations to improved empirical data to more accurate knowledge of actual practices. Further research on these suggested topics should lead to refinements and improvements in both the process and the results of special education cost estimation.

1. There were several areas where a combination of inadequate (i.e., highly uncertain and/or irregular) data and high cost impact existed. These included: articulation of handicapping conditions and special education needs; incidence rates of handicapping conditions; actual and alternative uses of resources; effectiveness of various programming patterns for different handicapping conditions; and effectiveness of various numbers of students per unit in different special education programs. Improved data in these areas will lead to better cost estimates but more importantly to programmatic and policy decisions based more on knowledge and evidence and less on tradition and assumption.

2. The whole area of related services is not sufficiently understood. Further studies should investigate the requirements of various types of

handicapped students for different related services, the magnitude of these requirements, the range and composition of possible related services, and the resultant costs.

3. The recent legislative and judicial actions have placed new demands on local program practices and costs. An examination of what actual changes are occurring and how costs are altered is essential if further cost projections are to reflect accurately the important programmatic trends in special education.

4. How the economies of scale affect special education costs, particularly at the local and regional levels, is another research topic of interest. What are the tradeoffs among the alternatives of regionalization versus district programs for low incidence handicapping conditions? Such investigations should include the effects on students as well as the cost impact.

5. With the potential changes in program practices for handicapped students, there are possibilities of cost shifts within the educational budget between special education and regular education. Such shifts can go in both directions. What will be the cost impact of such practices as: greater use of regular education programs for many mildly handicapped students; reduced class sizes in regular classrooms to accommodate handicapped students; and special education assumption of certain regular education programs and services? With possible large scale changes in program practices in the future, the magnitude of the cost shifts involved could become significant.

6. Based on the results of the investigations suggested above, a more precise modeling of the special education process could be undertaken. Such an effort should incorporate new and improved data on actual practices and

program effectiveness, related services, and expected future directions in special education.

7. Finally, similar cost estimation studies should be undertaken for both pre and postschool aged handicapped children. Using a similar resource-cost model approach, the studies should investigate the student characteristics, program alternatives, and organizational arrangements available for the delivery of special education services for these two different populations. Then, based on these programmatic results, the costs of serving these populations in an appropriate manner could be estimated.

Special education is and will continue to be of significant interest to educational policy makers, planners, and administrators. As the magnitude of resources devoted to the education of handicapped children increases, so will the need and demand for improved information concerning the costs of such programs. By making explicit the programmatic aspects of special education and linking these with their associated costs, the resource-cost model approach can provide an important tool to assist decision making and planning for the provision of programs for the education of handicapped children.

FOOTNOTES

[1]For a summary of statutory provisions of each state see "State Statutory Responsibilities for the Education of Handicapped Children, July 1, 1975," a chart prepared by the Development and Evaluation of State and Local Special Education Administrative Policy Manuals Project, council for Exceptional Children, Reston, Va. A comprehensive review of litigation relevant to the education of handicapped children is provided in Alan Abeson and Nancy Bolisk, eds., A Continuing Summary of Pending and Completed Litigations Regarding the Education of Exceptional Children (Reston, Va.: Council for Exceptional Children, 1974).

[2]Information reported in the Education for All Handicapped Children Act of 1975 in the Statement of Findings and Purpose (20 U.S.C. 1401 note) which summarized testimony before the Subcommittee on the Handicapped of the Committee on Labor and Public Welfare, U.S. Senate concerning 5.6, The Education for All Handicapped Children Act.

[3]Charles D. Bernstein, et al., Financing Educational Services for the Handicapped: An Analysis of Current Research and Practices (Reston, Va.: Council for Exceptional Children, 1976).

[4]For a thorough explanation of the model and its uses, see Peggy L. Hartman, et al., Special Education Planning Model: User Guide (Palo Alto, Ca.: Management Analysis Center, Inc., 1977).

[5]William T. Hartman, Estimating the Costs of Educating Handicapped Children: A Resource-Cost Model Approach (Washington, D.C.: U.S. Office of Education, Bureau of Education for the Handicapped, 1979). p. 96.

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